Yellow-billed Stork Presence at the East Kleinemonde Estuary in the Eastern Cape, South Africa

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2016

Figure 1. The best view…. C. Engelbrecht

1. Introduction

During an ongoing project of daily counts (that started in April 2015) of African Spoonbill (*Platalea alba*) at the West and East Kleinemonde Estuaries (Engelbrecht 2015a; Engelbrecht 2016), no Yellow-billed Stork *(Mycteria ibis*) were observed between 1 April 2015 and 13 July 2016 at these two estuaries, the Riet River Estuary and the Great Fish River Estuary. However, on 14 July 2016 three Yellow-billed Storks arrived at the West Kleinemonde Estuary (33° 32' S, 27° 02' E). The next day they had left but from then onwards, three were recorded at the East Kleinemonde Estuary (33° 32' S, 27° 03' E) suggesting that they crossed over. For the rest of the study period none were again recorded at the West Kleinemonde Estuary (Fig. 2) and by 8 August 2016, all of them had also left from the East Kleinemonde Estuary (Fig.3).

The purpose of this article is to document the results of observations of the three Yellow-billed Storks that were present from 14 July 2016 to 8 August 2016 at either one or both estuaries (Fig.6). Cryptic comments about their movement behaviour during this period are made and some comparisons to earlier literature about African Spoonbill at the same estuaries (Engelbrecht 2015b), will be drawn. This points at individual erratic movement occurrences that link to a network of important but fragmented water regimes (and suggestions for future research are proposed). A major

shortcoming in this study is that of the four Yellow-billed Storks that were ringed in southern Africa, no retrapped data is yet available (The South African Bird Ringing Unit 2016).

2. Study sites and methodology

The study sites in this study are the same as currently been used for the ongoing African Spoonbill study. Study site 1 is the area stretching (north) about 500 m upstream from the R72 road bridge over the West Kleinemonde Estuary (Fig.2).

Figure 2. Study site 1: West Kleinemonde Estuary. C. Engelbrecht

Study site 2 stretches (north) from the R72 road bridge over the East Kleinemonde Estuary (Fig.3) for about 400 m upstream.

Figure 3. Part of study site 2: the East Kleinemonde Estuary. C. Engelbrecht

The third study site 3 is the area (south) stretching from the R72 road bridge downstream to the East Kleinemonde Estuary mouth (Fig.4) towards the Indian Ocean.

Figure 4. Study site 3: The mouth area of the East Kleinemonde Estuary. C. Engelbrecht

Surveys were conducted on a daily basis from the same vantage points between 07:00 and 08:00 at three study sites. The count results were recorded on a count sheet (Fig.6). Photos were regularly taken (as supporting evidence and for future reference) with a DSLR camera and 170–500 mm telephoto lens. As circumstances required, a spotting scope (20x60x90) and or binoculars (10x50) were used. Three yellow-billed Storks that flew over these sites on three days (Fig.5) were excluded from the counts because they were proven with a reasonable degree of accuracy, to be the same three that were already counted on those days at the East Kleinemonde Estuary.

Figure 5. First fly over. C. Engelbrecht

3. Yellow-billed Stork counts from 14 July 2016 to 8 August 2016

The Yellow-billed Stork abundance for the above period was as follows:

	Count sheet	
Date of count	**West Kleinemonde Estuary**	**East Kleinemonde Estuary**
14/7	3	0
15/7	0	3
16/7	0	3 (Fly over also recorded.)
17/7	0	3
18/7	0	2
17/7	0	3
20/7	0	0
21/7	0	0
22/7	0	3 (Fly over also recorded.)
23/7	0	2
24/7	0	2
25/7	0	2
26/7	0	3 (Fly over also recorded.)
27/7	0	2 (Also seen at site 3 on this day.)
28/7	0	2 (Also seen at site 3 on this day.)
29/7	0	3
30/7	0	3
31/7	0	3
1/8	0	3 (Also seen at site 3 on this day.)
2/8	0	2
3/8	0	3 (Also seen at site 3 on this day.)
4/8	0	2
5/8	0	2
6/8	0	2
7/8	0	2
8/8	0	0

Figure 6. Daily Yellow-billed Stork counts at the West and East Kleinemonde Estuaries.

The arrivals (green), number of Yellow-billed Storks present (yellow), number having left (red), and none present (blank), at the East Kleinemonde Estuary, are presented as follows:

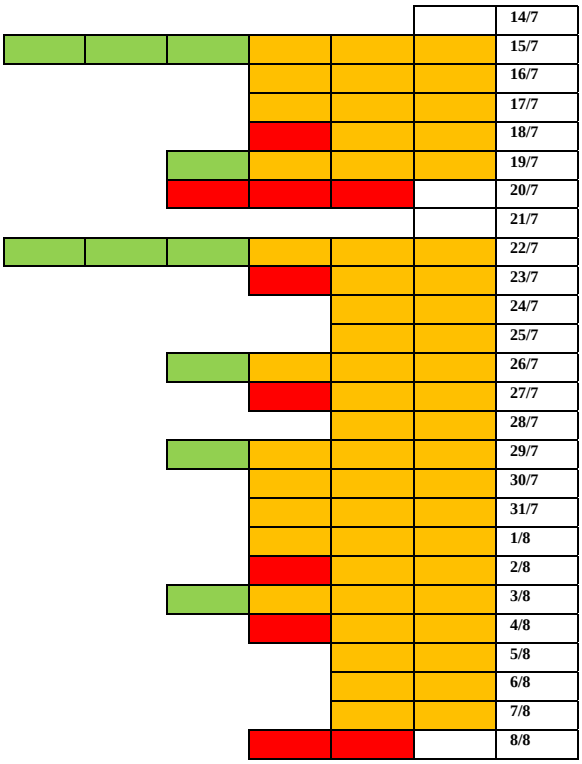

Figure 7. Number of arrivals, number present and number having left at the East Kleinemonde Estuary.

The number of days on which Yellow-billed Storks were present at both estuaries, are as follows:

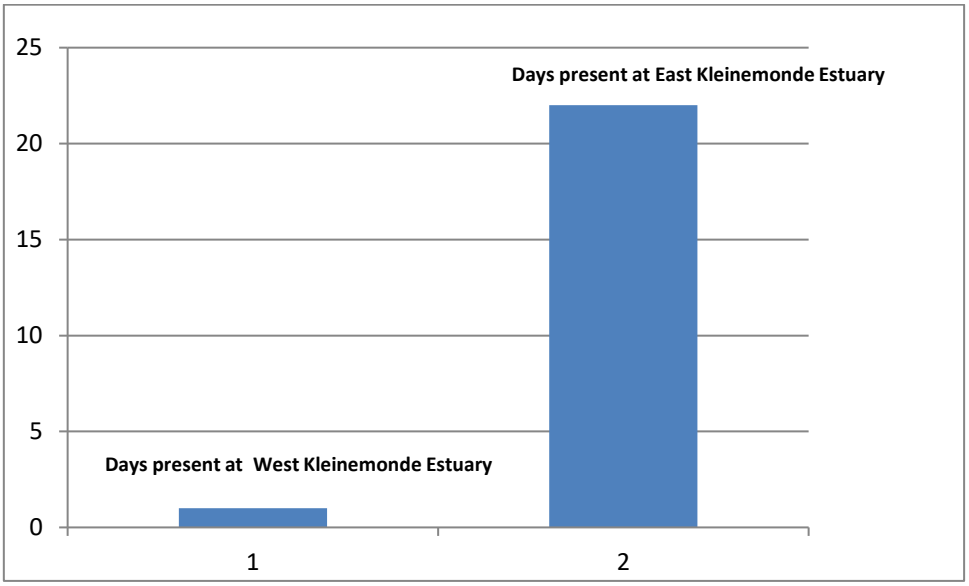

Figure 8. Number of days that Yellow-billed Storks were present at both estuaries.

On two of the 26 days (Fig.6 and Fig.7) during which Yellow-billed Storks were present, two were later seen in close proximity of the East Kleinemonde Estuary mouth about 500 m from study site 3 (Fig.9). On two other days (Fig.6 and Fig 7), three were later again seen on those days at the same location of site 3 (Fig.10).

Figure 9. The first arrival of Yellow-billed stork at study site 3 on 27 July 2016. C. Engelbrecht

Figure 10. At East Kleinemonde Estuary on 3 August 2016. C. Engelbrecht

The days on which the Yellow-billed Storks were absent from both estuaries, are illustrated in the graph below:

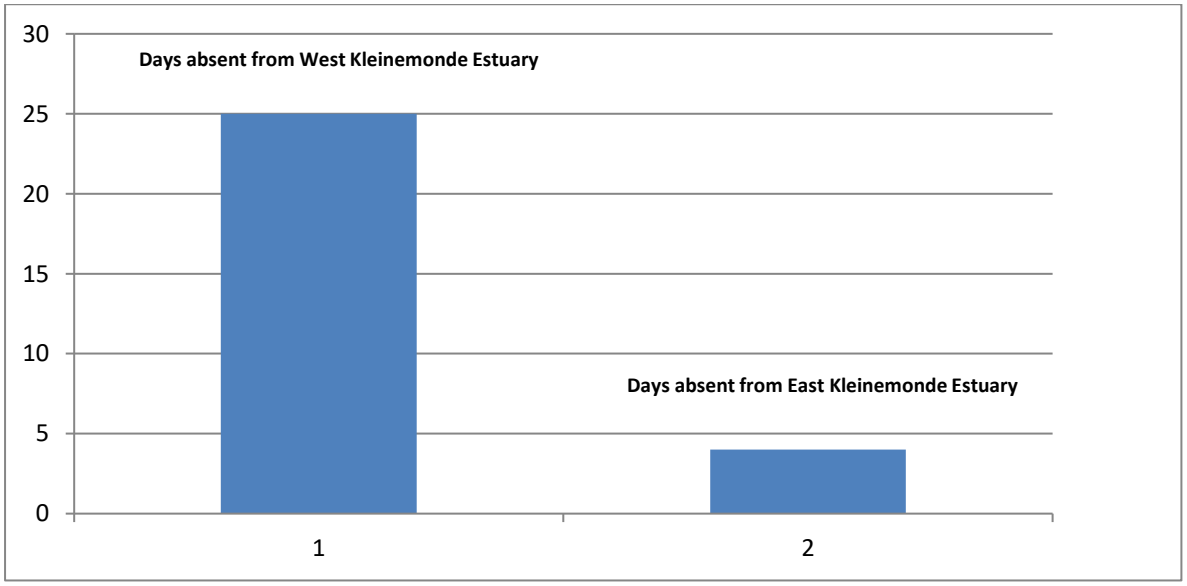

Figure 11. Number of days absent from both estuaries.

During the study period, the rainfall (Fig.12) in the immediate vicinity (compared to the same period in 2015) of the estuaries, was as follows:

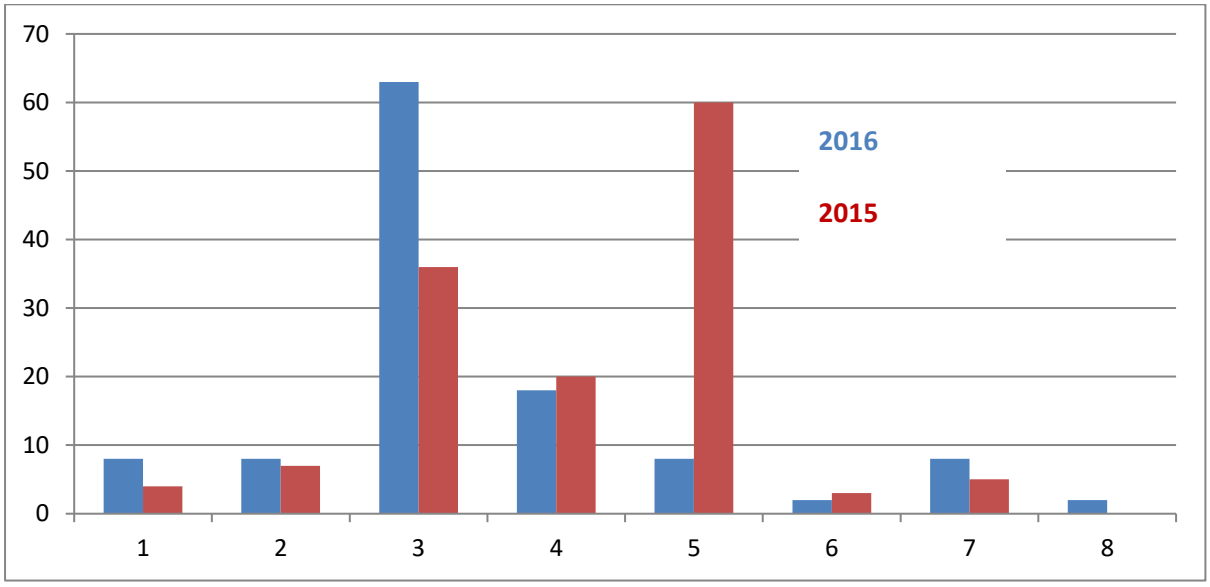

Figure 12. Rainfall of eight days from 14 July 2015 to 8 August 2015 compared to same period in 2016 at both estuaries.

The total rainfall at both estuaries for 2015 was 135 mm and 117 mm for 2016. As a result the water levels in 2016 rose ~62 cm by 8 August 2016, still not enough for the estuaries to breach their berms and they remained in their temporarily closed state, as was the case in 2015. Other weather considerations were excluded during the count.

4. Discussion of count results

If one considers that wetlands make up only about 1% of Africa's surface area (Kabii in Hails (ed.) 1996) and 0,56% of the surface area of South Africa (Terörde 2008: 1), then all estuaries, regardless of size, are of life sustaining importance to biodiversity of the continent and South Africa. Small to medium estuaries make up 77% of the number of the temporarily open estuaries in South Africa (Turpie 2012 :7). The South African population has also been predicted to reach 70 million by 2025 and 'as a result of increasing demand, all its exploitable freshwater natural resources will be used up' (Dikgang and Hosking 2015: 2). The criticalness of the sustainable wise-use and conservation of the three study sites, is probably best embodied in the following statement: 'In the case of small TOCEs [temporarily open/closed estuaries] such as the East Kleinemonde, it appears that water level is a major factor determining avifaunal abundance, because it affects habitat availability (e.g. shallow areas for wading) and food availability directly or indirectly (e.g. by affecting the availability of submerged macrophyte beds suitable for certain fish species)' (Whitfield *et al.* 2008: 466).

Yellow-billed Stork distribution range is large (BirdLife International 2016; Hancock *et al.* 1992: 50) with intra-African migration and nomadic movements in South Africa that are characterised by irregular movements (Anderson in Hockey *et al.* 2005: 617) because their movements are related to

rainfall. They ‘follow the floodwater, constantly in search of water with a high fish concentration’ (Salle 2009; Kahl 1968). The argument was previously made (Engelbrecht 2015b: 2–3) that African Spoonbill follow the rain front – it is also suggested here that the same holds for Yellow-billed Stork. Their well-being is therefore closely linked to inland and coastal waterbodies. The irregularity of their movement behaviour is influenced by declining or fluctuations in range size and severe habitat fragmentation in relation to local ecological conditions, is consistent with the situation in e.g. Asia where ‘stork habitats are being rapidly lost to land encroachment, pollution and other factors’ (Urfi 2011). When stage sites (or stopover sites – in our case the West and East Kleinemonde Estuaries) are ecologically severely altered between visits, the survival of the birds in general is compromised (Engelbrecht 2015a; Engelbrecht 2015b). One example will suffice. The avian influenza virus A/H5N1 that is highly pathogenic has been reported in 11 African countries. Since wild birds have the potential to be agents for transferring the A/H5N1 virus over inter- and intra-continental distances, the Afrotropical waterfowl, e.g. Storks and Egrets, that breed and winter in Africa (Ofula *et al.* 2013: 394–395), can detrimentally affect the already scarce estuarine water regimes. In so doing this could impact on species richness and abundance of such unfortunate habitats. This renders all habitats as critical ecologies (Biro 2011). But, in a study about the avian influenza risk of wild birds, the authors (Cumming *et al.* 2008) concluded: ‘There is currently little empirical evidence to suggest a major role for wild birds in moving H5N1 or other HPAI influenza viruses among populations of people or domestic poultry (Kilpatrick *et al.* 2006), but the possibility remains that migratory or nomadic wild birds could in future spread some form of HPAI rapidly over large distances’.

Some literature describe (at least in the late 1980s for the then Transvaal Province) Yellow-billed Stork as ‘[g]enerally scarce but regularly present in small numbers at a few localities; occurs singly, in small groups or occasionally larger flocks (170 recorded in northern Kruger National Park)’ (Tarboton *et al.* 1987: 25–26); also as ‘rarely singly, often in pairs, frequently in groups of up to ca 50 birds’ and ‘[o]ften associates with other storks, herons, pelicans and wading birds at favoured resting places’ (Anderson in Hockey *et al.* 2005: 617; De Castro 2016). In addition, they have been described as usually appearing in small groups of 10–20 and in exceptional instances, as many as 50. Although they usually forage as singletons or in small groups, they have also been noted to make up numbers in the hundreds (Hancock *et al.* 1992: 50). Nevertheless, a few years ago, researchers found 983 nests at Lake Urema (Moçambique) in an area of 15 ha (Stalmans *et al*. 2014: 54, 56), and in May 2014, more than 100 Yellow-billed Stork were photographed on their nests at Nyamithi Pan from the Ezulvini Hide (Ramsy 2014) at the Ndumo Game Reserve in northern KwaZulu-Natal. In the Okavango (Linyanti and Chobe regions) they were reported to be ‘[u]sually in small groups, occasionally solitary’ (Penry 1994: 60). Furthermore, Tarboton (2014: 40) also reported on their regular breeding presence in the Okavango (Botswana) and that in KwaZulu-Natal pairs of 10–100 were recorded, but seldom more than 20 at sites in the Kruger National Park or anywhere else. In the case of the East Kleinemonde Estuary, their abundance remained at three during this study period.

Added to the above movement and abundance variances, some populations are primarily sedentary. On four occasions they were seen standing motionless at the East Kleinemonde Estuary, head tucked seemingly under a wing (Carnaby 2014: 393), on the same spot for a period of 10–12 hours without moving as much as one meter. In a study about temperature and heart rate in domestic foul, the explanation is that once such motionless position has been adopted and maintained for a long period, maintenance activities for instance, are abandoned until a stimulus would change their behaviour into activity.

This raises the question of how long can they go without feeding? Hancock *et al.* (1992: 49–50) gave the following possible answer: 'storks feed apparently for only a short time, obtaining their requirements often very quickly and then resting.' This relative inactiveness is considered as somewhat anti-social behaviour because they are frequently seen standing alone and because they do not particularly seem to socialise with other Yellow-billed Storks (Listebarger 2009). Despite this apparent relaxed behaviour, storks are known to have the quickest muscular reflex of the neck, that enable them to swallow most food caught in the water with a single upwards and backwards jerk of the head. A study about the speed at which American Wood Stork shut the bill in foraging process, has been reported as only 0,025 seconds (Kahl and Peacock 1963: pp.505–506).

On 1 July 2016 four and on 8 July 2016 (that is before this study started) six Yellow-billed Stork were seen soaring (Carnaby 2014: 102) over the Duck Pond area in the business district of Port Alfred (some 15 km away from our study areas). It is unclear if they were in any way 'related' to the Yellow-billed Storks that frequented the study sites from 14 July 2016. In addition, Hardaker reported that at about the same time, Yellow-billed Storks were seen between the Diaz Dam along the Boknes – Cannon Rocks road and Ngciyo Pans (Hardaker 2016).

Once the three Yellow-billed Storks that arrived for the first time on 14 July 2016 at the West Kleinemonde Estuary crossed over to the East Kleinemonde Estuary, they did not return to the West Kleinemonde Estuary for the rest of the study period. However, when studying the figures of the East Kleinemonde Estuary, one can accept with reasonable confidence that they were the same three Storks that were from the following day onwards, seen at the two other locations on the East Kleinemonde Estuary, because the likelihood that they were present for only one day and were then replaced by new arrivals the following day at the East Kleinemonde Estuary, is small. This is consistent with the results of a previous African Spoonbill study about their behaviour at the West Kleinemonde Estuary (Engelbrecht 2016). Furthermore, on three occasions (16/7/2016 at 10:49; 22/7/2016 at 11:37, and 26/7/2016 at 8:45), three Yellow-billed Storks were photographed (Fig.5) in flight over the immediate area of the East Kleinemonde Estuary mouth. Visits to the three study sites then confirmed that at these times they were absent from the study sites although they were present and counted earlier in the mornings of 16, 22 and 26 July 2016 (Fig.6 and fig 7). Further consistencies are the following: Firstly, in the African Spoonbill study (Engelbrecht 2016), some arrived also at the West Kleinemonde Estuary and never returned.

Secondly, those African Spoonbills that left the West Kleinemonde Estuary went across to the East Kleinemonde Estuary (as was the case with the three Yellow-billed Storks). In both instances, this can be proven by the differences in the following day's counts.

Thirdly, once African Spoonbills arrived at the East Kleinemonde Estuary they never returned (with the exception of one day: 27 April 2015) to the West Kleinemonde Estuary for most of April 2016 (Engelbrecht 2016) – the same holds true for Yellow-billed Storks.

Lastly, Yellow-billed Storks sometimes foraged side-by-side with e.g. African Spoonbill, African Sacred Ibis, Black-headed Heron, Grey Heron, Cape Cormorant, Reed Cormorant, Yellow-billed Egret, Great Egret, Little Egret and Western Cattle Egret. This kind of 'twin hunting strategy' (Willgress 2015) displays a high level of foraging patience. It is therefore surprising that although Yellow-billed Storks share the same feeding locations with the above species at the study sites, they seem not to travel between sites with African Spoonbill. In addition, African Spoonbill and Yellow-billed Stork forages on the fringes of the water regime and on the fringes of the exposed 'islands' depending on the water fluctuations (Fig.13). Both species seem not to feed in open water stretches, although it might not be deeper than about 40 cm. This is consistent with water depth of 10–14 cm reported by Hancock *et al.* (1992: 50). This is also true at the East Kleinemonde Estuary: between 7 September and 18 September 2016, the water levels of the estuary rose by a further 21 cm after 41 mm rain were recorded in this period, making it too deep to forage. Secondly, the 'islands' (Fig. 2, Fig. 3 and Fig. 13) became covered with water and hence no vegetated fringes were left for foraging.

Figure 13. Foraging on the edges of shallow water at East Kleinemonde Estuary on 23 July 2016. C. Engelbrecht

A collection of photos substantiate that on a few occasions, Yellow-billed Storks frequented the same trees and nests together with, or previously visited by Black-headed and Grey Herons. Lastly, Yellow-

billed Storks showed their typical behaviour by using foot-movements to stir the immediate area where they forage. There are a few dissimilarities: Firstly, not only was the abundance of Yellow-billed Stork far less than that of African Spoonbill, but inter-estuarine movements by Yellow-billed Storks, were non-existent. Although Yellow-billed Stork shared the same three preferred sites – mainly at the East Kleinemonde Estuary study site 2, they were spread out over larger distances for most of the time when compared to African Spoonbill that seem to be more closely packed together with other members of their flock. Unlike Maclean's description of Yellow-billed Stork as 'rarely solitary' (Maclean 1993: 71), most photos show that these three Yellow-billed Storks mostly gave the impression of singletons at study sites 2 and 3.

Secondly, this seems to suggest that when food abundance is spread out over larger distances, the birds spread out accordingly, giving the impression of singletons. This is because for a period of about one week when a flock of about 176 immature Cape Cormorant frequented two specific spots at study site 2 and congregated there, African Spoonbill and Yellow-billed Stork followed them backwards and forwards from one site to another. This behaviour was described in the following manner: 'they would wade together towards one end of the pool driving the fish in front of them and then they will pick them from the reduced area they had created' (De Castro 2016). For one day only, one Yellow-billed Stork repeatedly spread its wing in full – similar to a habit of Slaty Egret described 'when stabbing at prey' (Maclean 1993: 52; Herremans in Hockey *et al.* 2005: 581), also described as opening one wing 'to shade water on the same side as foot-stirring' (Anderson in Hockey *et al.* 2005: 617).

Thirdly, there seems to be a feeding commensalism relationship between Wood Stork, Spoonbill and Glossy Ibis which have 'been following behind a crocodile moving slowly through water weed. The birds obviously found it an advantage feeding off freshly stirred up aquatic insects and small molluscs' (Pooley 1967: 12; Hancock *et al.* 1992: 49–50).

It is not clear where these three Yellow-billed Storks came from and where they went once they had left. One can only hypothesize that they were the same three that arrived the following day at the East Kleinemonde Estuary. The suggestion is that they are local migrants and frequent an array of aquatic habitats. One can also ask why there were no inter-estuary movements during the study period. Is the one bird that left the East Kleinemonde Estuary on 18/7/2016, the same one that returned the following day? Its whereabouts are not known for the interim period. The three that left on 20/7/2016 and stayed away for two consecutive days, were most likely the same birds that returned on 22/7/2016. The same hypothesis applies for 23/7/2016 onwards. The last two that left on 8/8/2016 most likely (as they were previously seen as a group of three birds) joined the one that left earlier (on 4/8/2016) and that were not seen again. It appears as if one of the three was more mobile that the other two because of its greater movement history. Although the birds arrived together on 14/7/2016, they did not leave together. In this regard, Hancock *et al.* (1992: 50) stated that 'the general movements [of Yellow-billed Stork] are poorly known, and in some areas it remains year-round. It is probably best to

describe the Yellow-billed Stork as a facultatively nomadic species, avoiding areas where water or rainfall conditions are inappropriate' for finding food. The formulation of a 'floater/s hypothesis' based on their presumable movement behaviour, might in future shed light if considered in conjunction with FSFD considerations.

5. Conclusion

The presence of these three Yellow-Billed Storks at the East Kleinemonde Estuary is consistent with '[a]nimal collective patters such as groups size frequency distribution [that] often show substantial intraspecific variation, suggesting low-species consistency' (Jovani *et al*. 2012: 397).

These observations lend themselves for a long-term comparative study of the relative flock size frequency distribution (FSFD) between Yellow-billed Stork and African Spoonbill. The four-level model suggested studying the plasticity of FSFD that distinguishes between individual level, pair level, partial-flock level and full-flock level of analysis (Engelbrecht 2016), seems useful for such future investigations to gain further understanding of inter-species behaviour. For instance, why were the birds sedentary for long periods of time if they were at poor foraging conditions, or is the latter the reason for the former?

Secondly, when compared to African Spoonbill presence at these study sites (Engelbrecht 2015a; Engelbrecht 2016), the variety in foraging and dispersal considerations of FSFD (using the four-level model of analysis), link estuaries to the migration process. Thus, one can ask if the distances between estuarine water bodies in the Eastern Cape Province of South Africa act as ecological barriers that contribute to the varying abundance of Yellow-billed Storks, or are their FSFD the result of the geophysical location of suitable stage sites that relate to non-breeding and foraging requirements.

Since habitats vary over space and time, the selection of preferred habitats for use by the birds, seems to go through a pecking order, such as movement decisions in relation to e.g. foraging, dispersal and migration. The selection of habitat is in relation to the need for survival. This is a regulatory factor in the dispersal and growth of populations. The relationship of a hierarchy of movement behaviour to FSFD needs to be clarified for this species.

Yellow-billed Storks need to make behavioural decisions that relate to FSFD in terms of the factors that influence their needs – for instance, the indications that they overnight somewhere else, and having different migratory strategies such as e.g. no migratory connectivity, parallel migratory options or flyway migratory options. This complicates a possible understanding of their movement ecology. Long-term ecological investigations of this habitat might reveal some factors that are affecting foraging Yellow-billed populations. Future investigation can be based on research conducted by Terörde (2008) about diverse bird species use of the East Kleinemonde Estuary for their different daily activities.

To understand the links of stopover sites across larger geographic areas (Bonter *et al.* 2009: 440) in e.g. the Eastern Cape Province, and the necessity to compare the landscapes that surround stopover

locations in order to make comparisons requires more investigation. The data gathered in this study indicates that an examination of individual migration events of Yellow-billed Stork in relation to the distribution of fragmented water bodies (e.g. estuaries) that are situated in altering landscapes (e.g. by farming practices), would help to identify areas where birds concentrate between migratory flights as a step 'toward integrating migration-habitat priorities into avian conservation plans' (Bonter *et al.* 2009: 441). Neo-conservation considerations that could flow from such understanding stand to benefit the future of Yellow-billed Stork in a pro-active species-specific conservation management strategy. Consideration could be given to consider all waterbodies, regardless of size and despite the fact that they are not located in IBAs, as critical ecologies and to treat them as a matter of course, as such. In so-doing this can lead to the definition of vital water corridors and dispersal areas outside the officially protected areas. This suggestion is based on the fact that the large number of small and medium estuaries account for a large water regime that is highly fragmented but of major importance to the species richness that they support.

There is an indication that different species benefit for e.g. the Yellow-billed Stork, thus affecting their relative FSFD. Various biotic interactions suggest the necessity to analyse flocking behaviour as a subset of avifauna ecology, because the formation of possible flocks are also dependent on some birds' tendencies to form flocks or not. The four-level model of analysis also prompts investigation into the characteristics that of each level of FSFD formation. It seems questionable if Yellow-billed Storks can be regarded as a 'nuclear' or 'sentinel' species but rather as an 'associate' species (Goodale *et. al.* 2015: 4). There appears to be 'leaders' and 'laggards' in the FSFD phenomenon – some are *dependistas* and others not. This is based on observations that the one Yellow-billed Stork frequently left and returned to the remaining two birds at the East Kleinemonde Estuary during the study period.

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